

Realization of ultra-high spectral purity with the opto-electronic oscillator*

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Recent results with the Opto-Electronic Oscillator (OEO) have led to the realization of very high spectral purity. Experimental results have produced a performance characterized by a noise as low as -50 dBc/Hz at 10 Hz for a 10 GHz OEO. The unit was built in a compact package containing an integrated DFB laser and the modulator. This performance is significant because the oscillator is free running, and since the noise in an OEO is independent of the oscillation frequency, the same result can also be obtained at higher frequencies. The result also demonstrates that high frequency, high performance, low cost, and miniature OEO can be realized with the integrated photonic technology. We have also developed a novel carrier suppression technique to reduce the $1/f$ phase noise of the oscillator even further. The technique is based on the use of a long fiber delay, in place of the high Q cavity, to implement carrier suppression. Our preliminary experimental results indicate an extra 10 to 20 dB phase noise reduction of the OEO with this novel technique. Further noise reduction beyond this value is expected with improved circuit design and longer reference fiber.

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